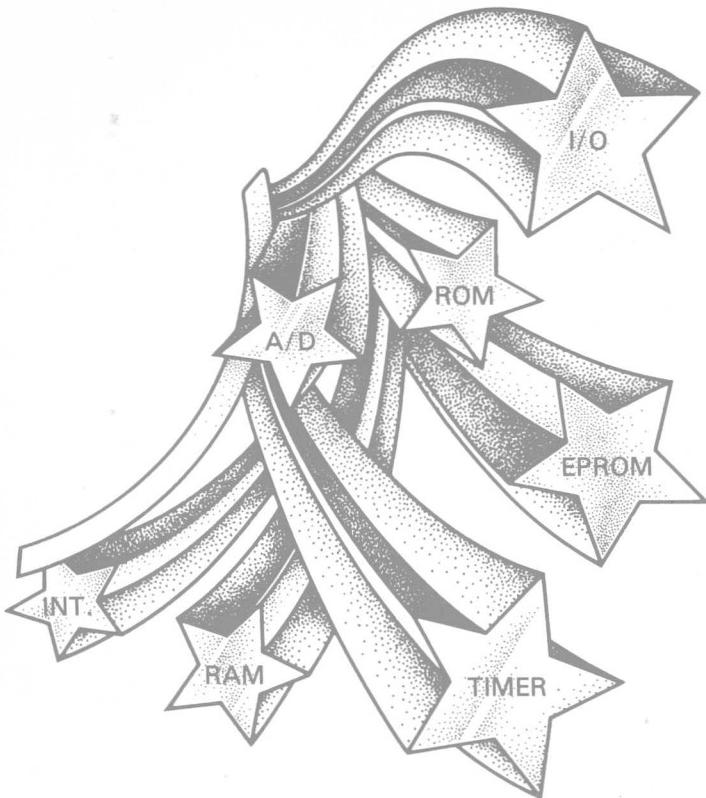


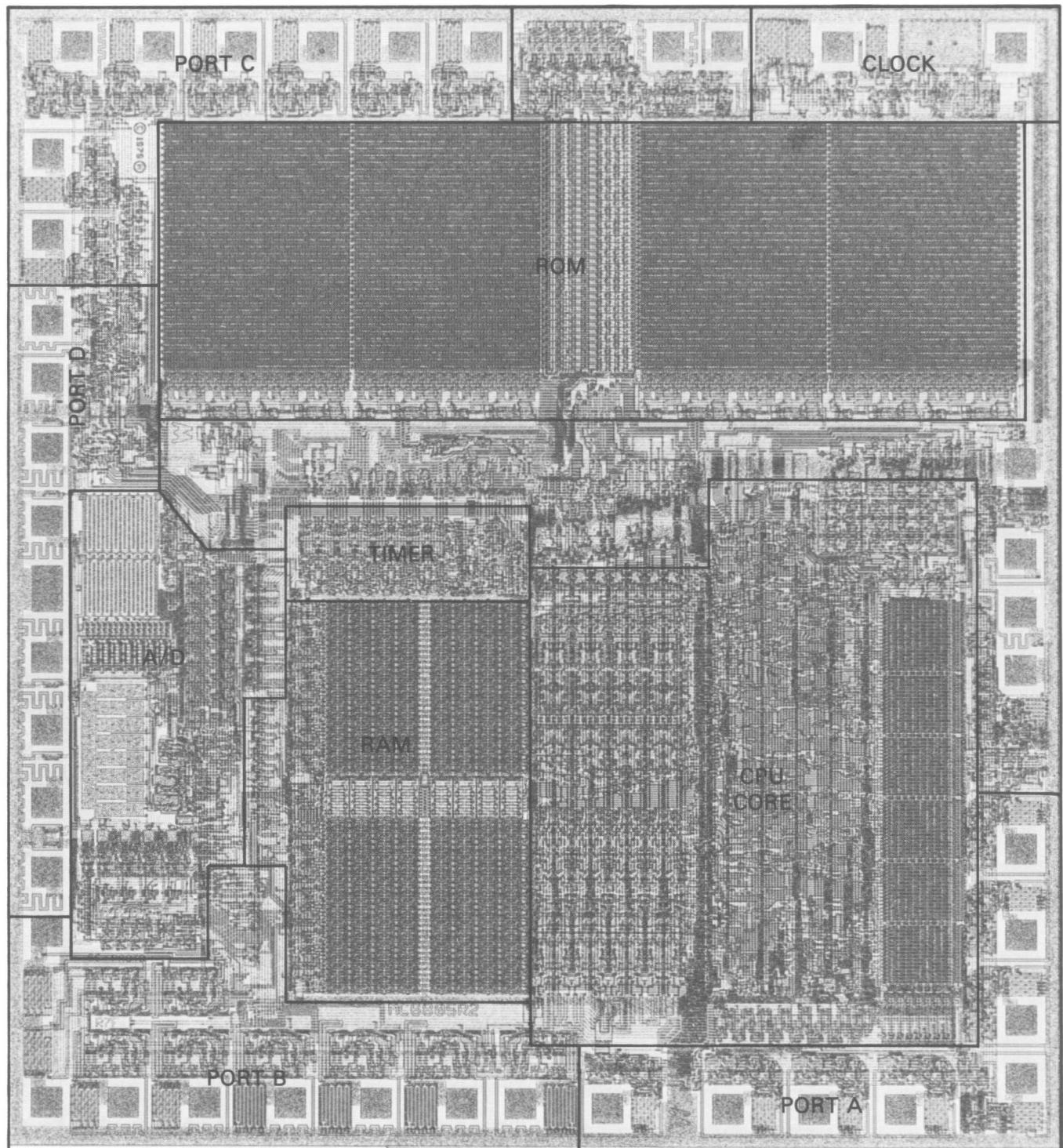
M6805FM



HMOS M6805 FAMILY



MOTOROLA



MC6805R2 — A MEMBER OF THE M6805 FAMILY

Motorola reserves the right to make changes to any products herein to improve reliability, function or design. Motorola does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights nor the rights of others.

HMOS M6805 FAMILY

The M6805 Family of 8-bit single-chip microcomputers combines the economy of HMOS with the application flexibility of the M6800 Family.

HMOS — Production scaling of NMOS has led to Motorola's high-density HMOS. The M6805 Family of microcomputers (MCUs) uses the device geometry of HMOS to decrease the die size. Small die size lowers the cost of each die and raises the wafer yield. The HMOS process provides low price solutions and increases the performance of the M6805 Family.

M6800 Heritage — The M6805 Family has evolved from the M6800 Family. Most of the standard M6800 features are incorporated in the M6805 Family. Included are programmable bidirectional I/O, flexible memory organization, many memory reference instructions, interrupts, and multi-level subroutine nesting. The M6805 Family adds ROM use efficiency and bit manipulation instructions.

Configuration Flexibility – The M6805 is a growing family of MCUs. Each MCU has the same core processor, but the memory and I/O features vary for optimal system adaptability. The MC6805P2 has 1.1 k of ROM, while the MC6805U2 has 2 k and more I/O. A 4-channel A/D converter is included in the MC6805R2. The MC68705P3 is an EPROM version. Some models are in 28-pin packages for space saving ('P2 and 'P3), while others are in 40 pins ('U2 and 'R2). Additional versions are coming with other mixes of memory and I/O features.

Programming — The enhanced M6800 architectural features make the M6805 Family the easiest to program of any MCU on the market. The stack pointer permits many subroutine levels. Three ROM efficient indexed addressing modes allow for look-up tables anywhere in memory. Single instructions can either modify or branch on the state of any I/O pin or RAM bit. RAM, ROM, and I/O registers are all accessed with the same powerful memory addressing instructions. An efficient instruction set permits programs to be written faster, easily optimized and, therefore, more reliable.

Self Check — When the Self Check Mode is initiated, the M6805 MCUs test themselves. The Self Check feature uses on-chip ROM, separate from the user ROM, to check the functionality of all key features; including RAM, ROM, and I/O. Self Check serves as an operational screening method for users.

Interrupts — Real-Time applications require sensing, measuring and controlling system events. For event driven tasks, two vectored interrupts, which stack the program registers, are included to implement these applications. For time dependent tasks, a programmable 8-bit counter generates an interrupt when an overflow occurs. The timer includes a selectable 7-bit prescaler and a choice of input options. The input options are for external signals, pulse width measurement and the on-chip oscillator. The second interrupt is an external interrupt pin. Software techniques are not needed for I/O synchronization.



MOTOROLA

SEMICONDUCTORS

3501 ED BLUESTEIN BLVD., AUSTIN, TEXAS 78721

MC6805P2

Product Description

8-BIT MICROCOMPUTER UNIT

The MC6805P2 Microcomputer Unit (MCU) is a member of the M6805 Family of microcomputers. This 8-bit microcomputer contains a CPU, on-chip clock, ROM, RAM, I/O and timer. It is designed for the user who needs an economical microcomputer with the proven capabilities of the M6800-based instruction set. The following are some of the hardware and software highlights of the MCU.

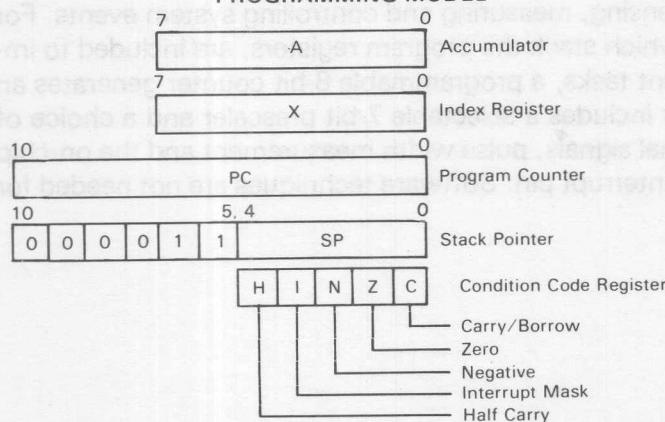
HARDWARE FEATURES:

- 8-Bit Architecture
- 64 Bytes of RAM
- Memory Mapped I/O
- 1100 Bytes of User ROM
- Internal 8-Bit Timer with 7-Bit Prescaler
- Vectored Interrupts — External and Timer
- Zero Cross Detection
- 20 TTL/CMOS Compatible I/O Lines; 8 Lines LED Compatible
- On-Chip Clock Circuit
- Self-Check Mode
- Master Reset
- Low Voltage Inhibit
- Complete Development System Support on EXORciser
- 5 Vdc Single Supply

SOFTWARE FEATURES:

- Similar to M6800
- Byte Efficient Instruction Set
- Easy to Program
- True Bit Manipulation
- Bit Test and Branch Instructions
- Versatile Interrupt Handling
- Powerful Indexed Addressing for Tables
- Full Set of Conditional Branches
- Memory Usable as Registers/Flags
- Single Instruction Memory Examine/Change
- 10 Powerful Addressing Modes
- All Addressing Modes Apply to ROM, RAM and I/O

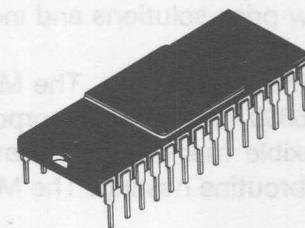
PROGRAMMING MODEL



HMOS

(HIGH DENSITY
N-CHANNEL, SILICON-GATE
DEPLETION LOAD)

8-BIT MICROCOMPUTER

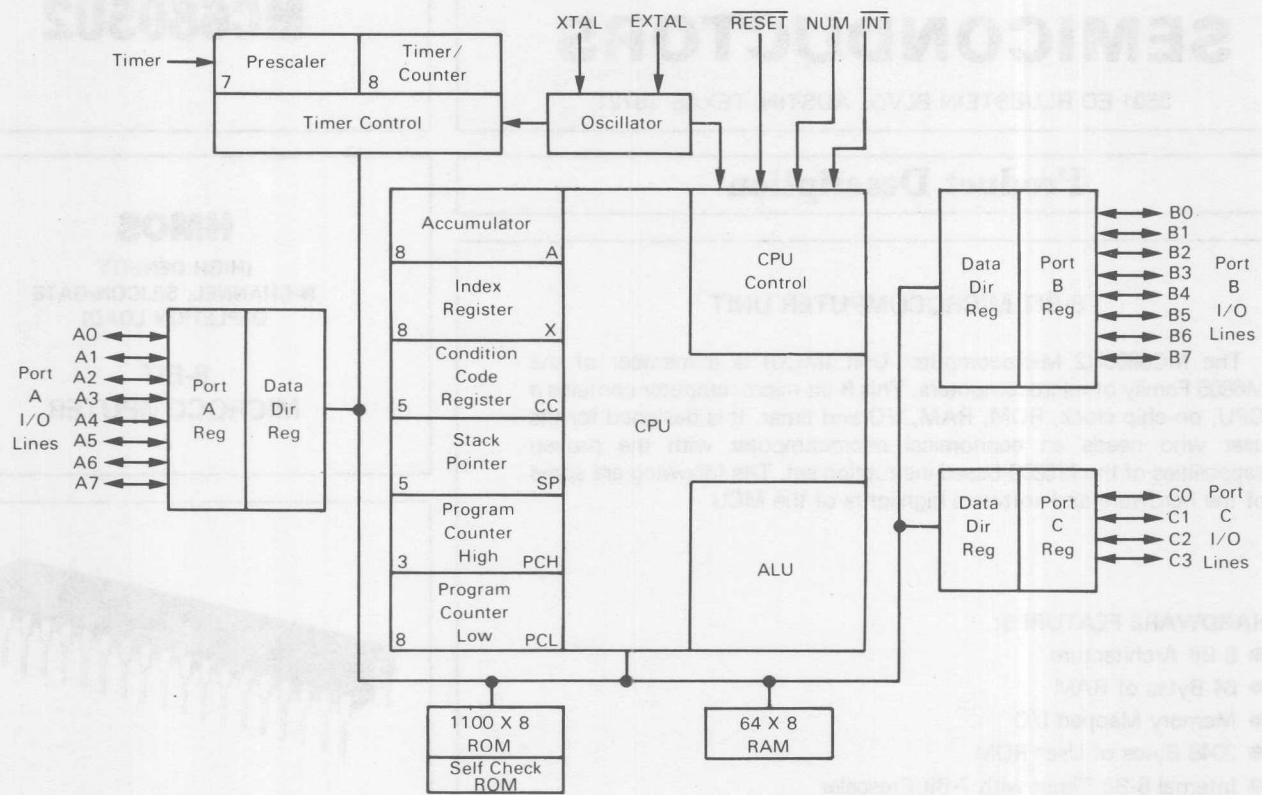


PIN ASSIGNMENTS

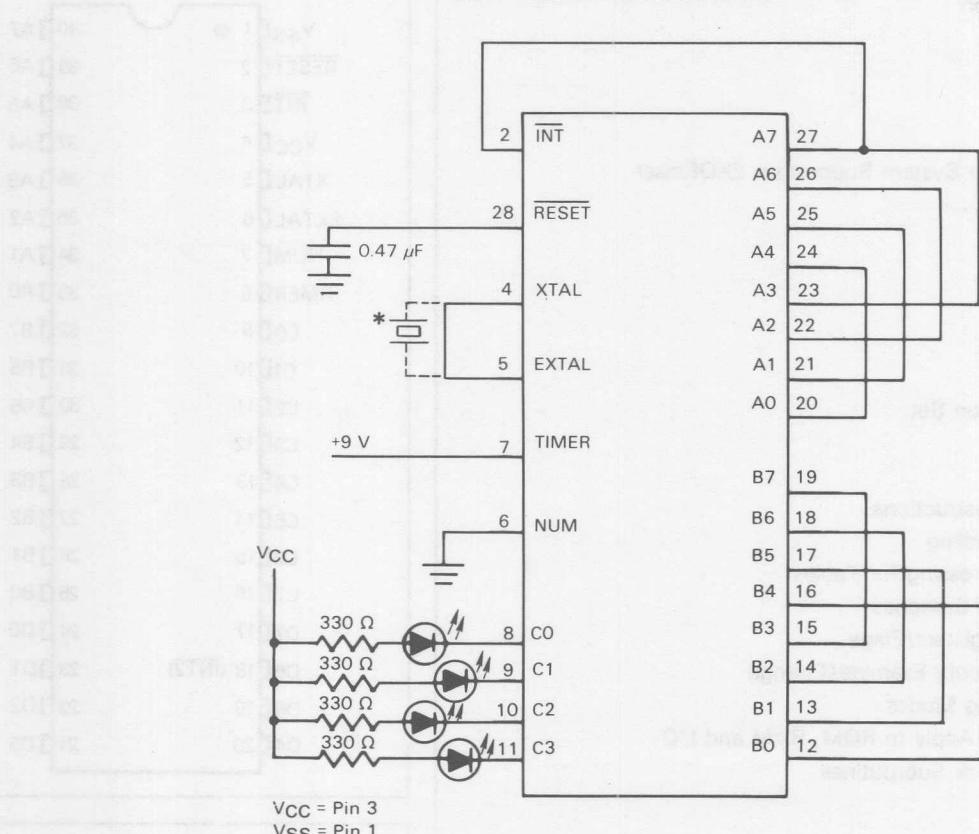
V _{SS}	1	RESET
INT	2	A7
V _{CC}	3	A6
XTAL	4	A5
EXTAL	5	A4
NUM	6	A3
TIMER	7	A2
C0	8	A1
C1	9	A0
C2	10	B7
C3	11	B6
B0	12	B5
B1	13	B4
B2	14	B3

AVAILABLE NOW

MC6805P2 HMOS MICROCOMPUTER BLOCK DIAGRAM



SELF CHECK CONNECTIONS



*Use when crystal mask option is specified.



MOTOROLA Semiconductor Products Inc.



MOTOROLA

SEMICONDUCTORS

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Product Description

8-BIT MICROCOMPUTER UNIT

The MC6805U2 Microcomputer Unit (MCU) is a member of the MC6805 Family of microcomputers. This 8-bit microcomputer contains a CPU, on-chip clock, ROM, RAM, I/O and timer. It is designed for the user who needs an economical microcomputer with the proven capabilities of the M6800-based instruction set. The following are some of the hardware and software highlights of the MCU.

HARDWARE FEATURES:

- 8-Bit Architecture
- 64 Bytes of RAM
- Memory Mapped I/O
- 2048 Bytes of User ROM
- Internal 8-Bit Timer with 7-Bit Prescaler
- 4 Vectored Interrupts — Two External, Timer and Software
- 24 TTL/CMOS Compatible I/O Lines; 8 Lines LED Compatible
- 8 Input Lines
- Zero-Crossing Detection
- On-Chip Clock Circuit
- Self-Check Mode
- Master Reset
- Low Voltage Inhibit
- Complete Development System Support on EXORciser
- 5 Vdc Single Supply

SOFTWARE FEATURES:

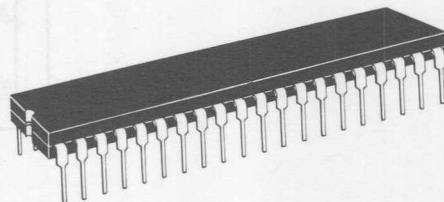
- Similar to M6800
- Byte Efficient Instruction Set
- Easy to Program
- True Bit Manipulation
- Bit Test and Branch Instructions
- Versatile Interrupt Handling
- Powerful Indexed Addressing for Tables
- Full Set of Conditional Branches
- Memory Usable as Registers/Flags
- Single Instruction Memory Examine/Change
- 10 Powerful Addressing Modes
- All Addressing Modes Apply to ROM, RAM and I/O
- User Callable Self-Check Subroutines

MC6805U2

HMOS

(HIGH DENSITY
N-CHANNEL, SILICON-GATE
DEPLETION LOAD)

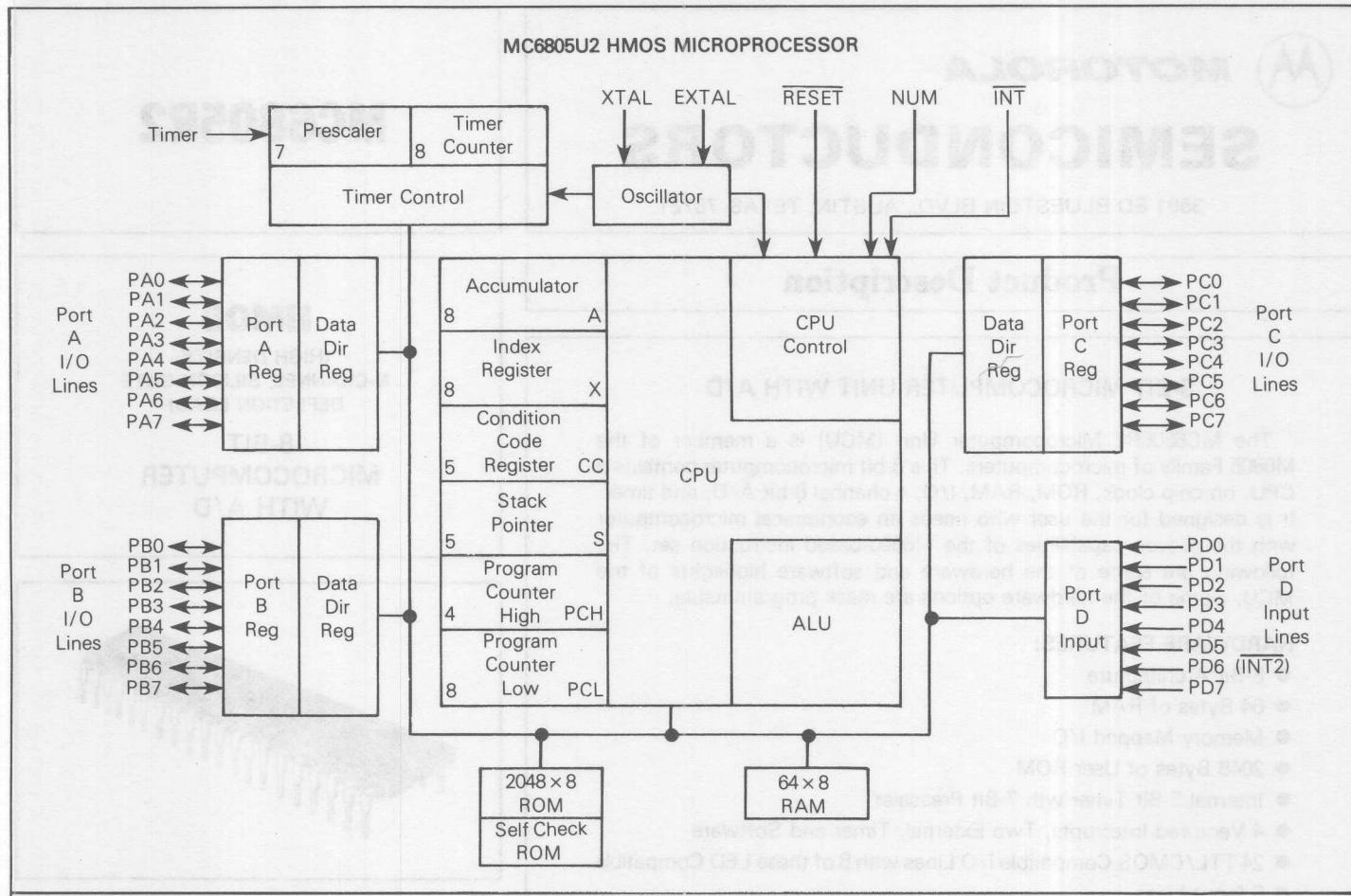
**8-BIT
MICROCOMPUTER**



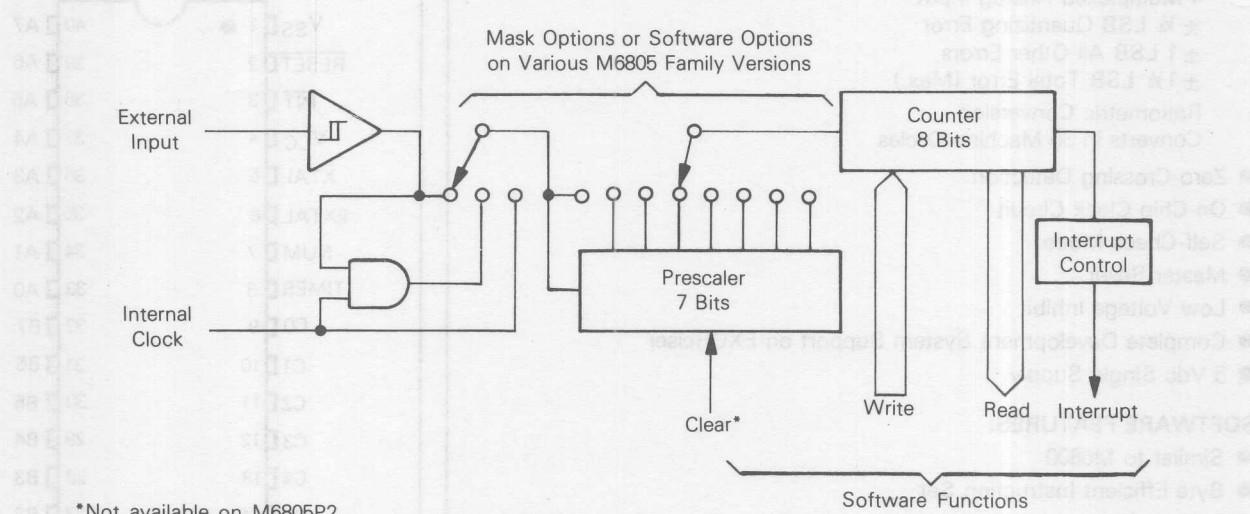
PIN ASSIGNMENTS

VSS	1	40	A7
RESET	2	39	A6
INT	3	38	A5
V _{CC}	4	37	A4
XTAL	5	36	A3
EXTAL	6	35	A2
NUM	7	34	A1
TIMER	8	33	A0
C0	9	32	B7
C1	10	31	B6
C2	11	30	B5
C3	12	29	B4
C4	13	28	B3
C5	14	27	B2
C6	15	26	B1
C7	16	25	B0
D7	17	24	D0
D6	18 (INT2)	23	D1
D5	19	22	D2
D4	20	21	D3

AVAILABLE 3Q 1980



TIMER/COUNTER BLOCK DIAGRAM



*Not available on M6805P2

TIMER

The 8-bit counter is loaded under program control and is decremented toward zero as soon as the clock input is applied. When the timer reaches zero, the timer interrupt is initiated.

The clock input to the timer can be from an external source applied to the TIMER input pin or it can be the internal clock. The TIMER is useful for pulse-width measurement, counting external events, and timing periodic intervals.



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Product Description

8-BIT MICROCOMPUTER UNIT WITH A/D

The MC6805R2 Microcomputer Unit (MCU) is a member of the MC6805 Family of microcomputers. This 8-bit microcomputer contains a CPU, on-chip clock, ROM, RAM, I/O, 4 channel 8-bit A/D, and timer. It is designed for the user who needs an economical microcomputer with the proven capabilities of the M6800-based instruction set. The following are some of the hardware and software highlights of the MCU. Some of the hardware options are mask programmable.

HARDWARE FEATURES:

- 8-Bit Architecture
- 64 Bytes of RAM
- Memory Mapped I/O
- 2048 Bytes of User ROM
- Internal 8-Bit Timer wth 7-Bit Prescaler
- 4 Vectored Interrupts, Two External, Timer and Software
- 24 TTL/CMOS Compatible I/O Lines with 8 of these LED Compatible
- 8 Input Lines
- Analog to Digital Converter
 - 8-Bit Conversion
 - 4 Multiplexed Analog Input
 - ± ½ LSB Quantizing Error
 - ± 1 LSB All Other Errors
 - ± 1½ LSB Total Error (Max.)
- Ratiometric Conversion
 - Converts in 30 Machine Cycles
- Zero-Crossing Detection
- On-Chip Clock Circuit
- Self-Check Mode
- Master Reset
- Low Voltage Inhibit
- Complete Development System Support on EXORciser
- 5 Vdc Single Supply

SOFTWARE FEATURES:

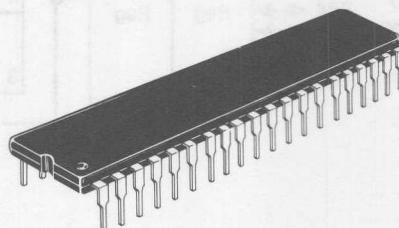
- Similar to M6800
- Byte Efficient Instruction Set
- Easy to Program
- True Bit Manipulation
- Bit Test and Branch Instructions
- Versatile Interrupt Handling
- Versatile Index Register
- Powerful Indexed Addressing for Tables
- Full Set of Conditional Branches
- Memory Usable as Registers/Flags
- Single Instruction Memory Examine/Change
- 10 Powerful Addressing Modes
- All Addressing Modes Apply to ROM, RAM, and I/O
- User Callable Self-Check Subroutines

MC6805R2

HMOS

(HIGH DENSITY
N-CHANNEL, SILICON-GATE
DEPLETION LOAD)

8-BIT MICROCOMPUTER WITH A/D

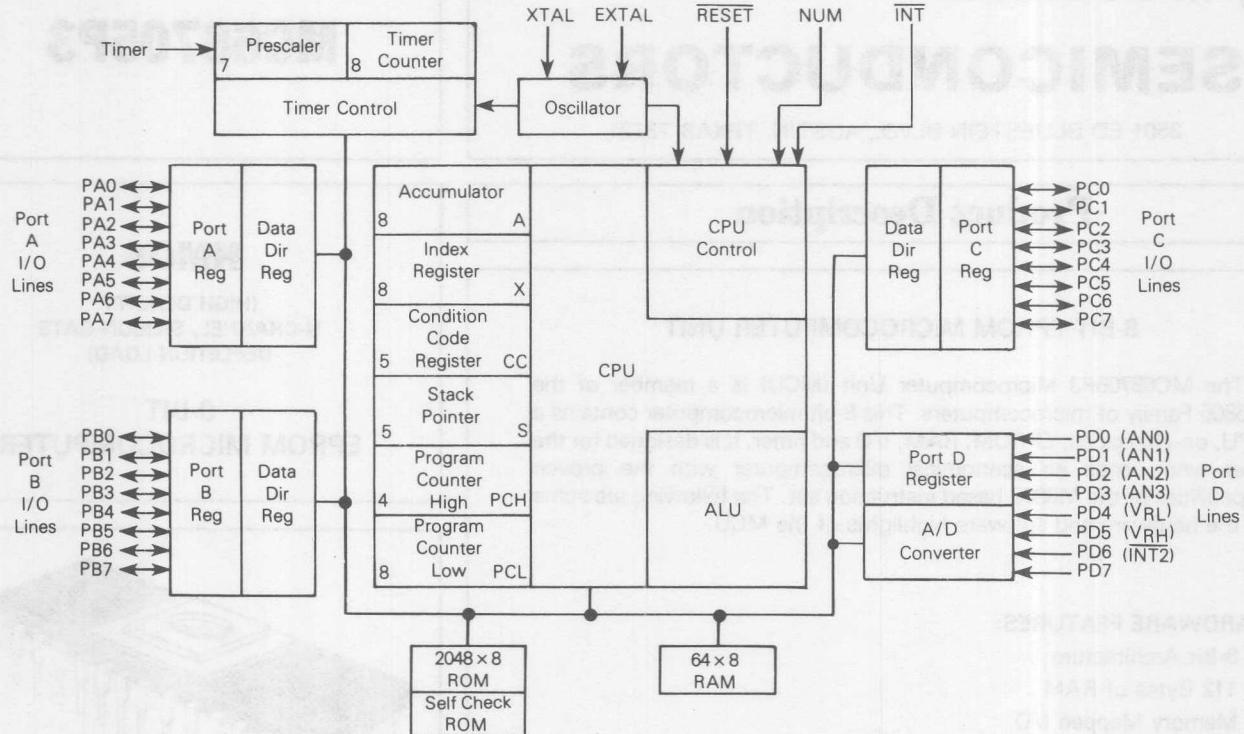


PIN ASSIGNMENTS

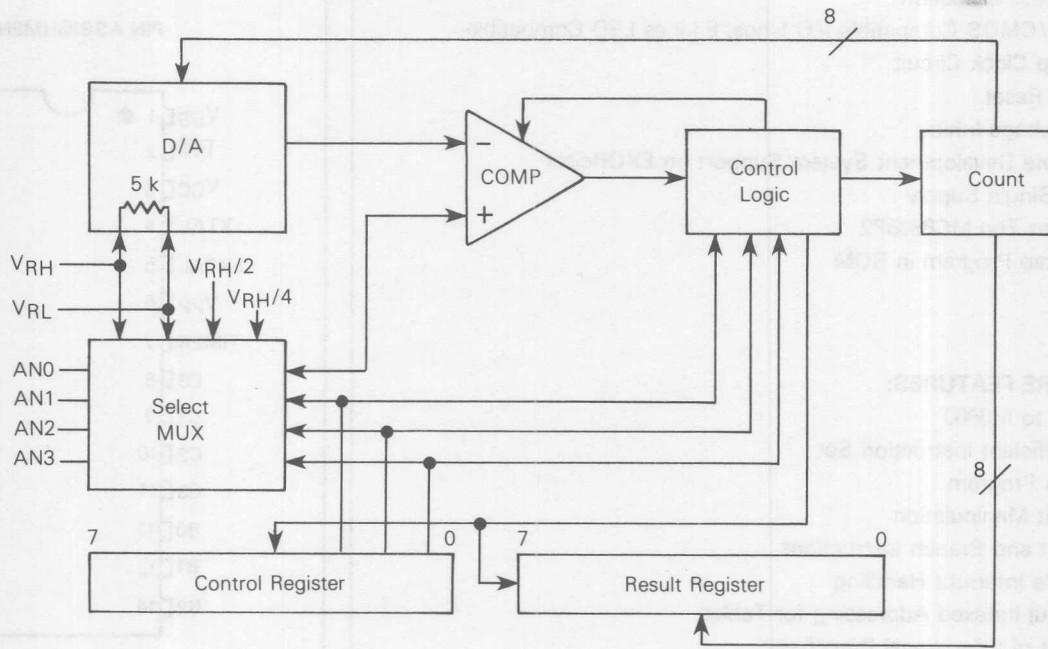
V _{SS}	1	40	A7
RESET	2	39	A6
INT	3	38	A5
V _{CC}	4	37	A4
XTAL	5	36	A3
EXTAL	6	35	A2
NUM	7	34	A1
TIMER	8	33	A0
C0	9	32	B7
C1	10	31	B6
C2	11	30	B5
C3	12	29	B4
C4	13	28	B3
C5	14	27	B2
C6	15	26	B1
C7	16	25	B0
D7	17	AN0	D0
D6	18	INT2	AN1
D5	19	VRH	23
D4	20	VRL	AN2
			D2
			AN3
			D3

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MC6805R2 HMOS MICROCOMPUTER BLOCK DIAGRAM



A/D BLOCK DIAGRAM



A/D CONVERTER

The 8-bit A/D converter with a 4-input multiplexer is implemented using the successive approximation technique. The converter operates continuously with one conversion re-

quiring 30 machine cycles. The conversion complete flag is set at the end of a conversion. Sample and hold is provided on-chip.



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MC68705P3

Product Description

8-BIT EPROM MICROCOMPUTER UNIT

The MC68705P3 Microcomputer Unit (MCU) is a member of the M6805 Family of microcomputers. This 8-bit microcomputer contains a CPU, on-chip clock, EPROM, RAM, I/O and timer. It is designed for the user who needs an economical microcomputer with the proven capabilities of the M6800-based instruction set. The following are some of the hardware and software highlights of the MCU.

HARDWARE FEATURES:

- 8-Bit Architecture
- 112 Bytes of RAM
- Memory Mapped I/O
- 1804 Bytes of User EPROM
- Internal 8-Bit Timer with 7-Bit Prescaler
 - Programmable Prescaler
 - Programmable Timer Input Modes
- Vectored Interrupts — External and Timer
- Zero-Cross Detection
- 20 TTL/CMOS Compatible I/O Lines; 8 Lines LED Compatible
- On-Chip Clock Circuit
- Master Reset
- Low Voltage Inhibit
- Complete Development System Support on EXORciser
- 5 Vdc Single Supply
- Emulates The MC6805P2
- Bootstrap Program in ROM

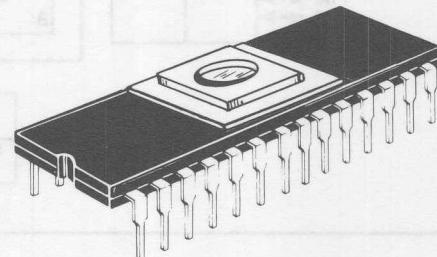
SOFTWARE FEATURES:

- Similar to M6800
- Byte Efficient Instruction Set
- Easy to Program
- True Bit Manipulation
- Bit Test and Branch Instructions
- Versatile Interrupt Handling
- Powerful Indexed Addressing for Tables
- Full Set of Conditional Branches
- Memory Usable as Registers/Flags
- Single Instruction Memory Examine/Change
- 10 Powerful Addressing Modes
- All Addressing Modes Apply to EPROM, RAM and I/O

HMOS

(HIGH DENSITY
N-CHANNEL, SILICON-GATE
DEPLETION LOAD)

8-BIT EPROM MICROCOMPUTER

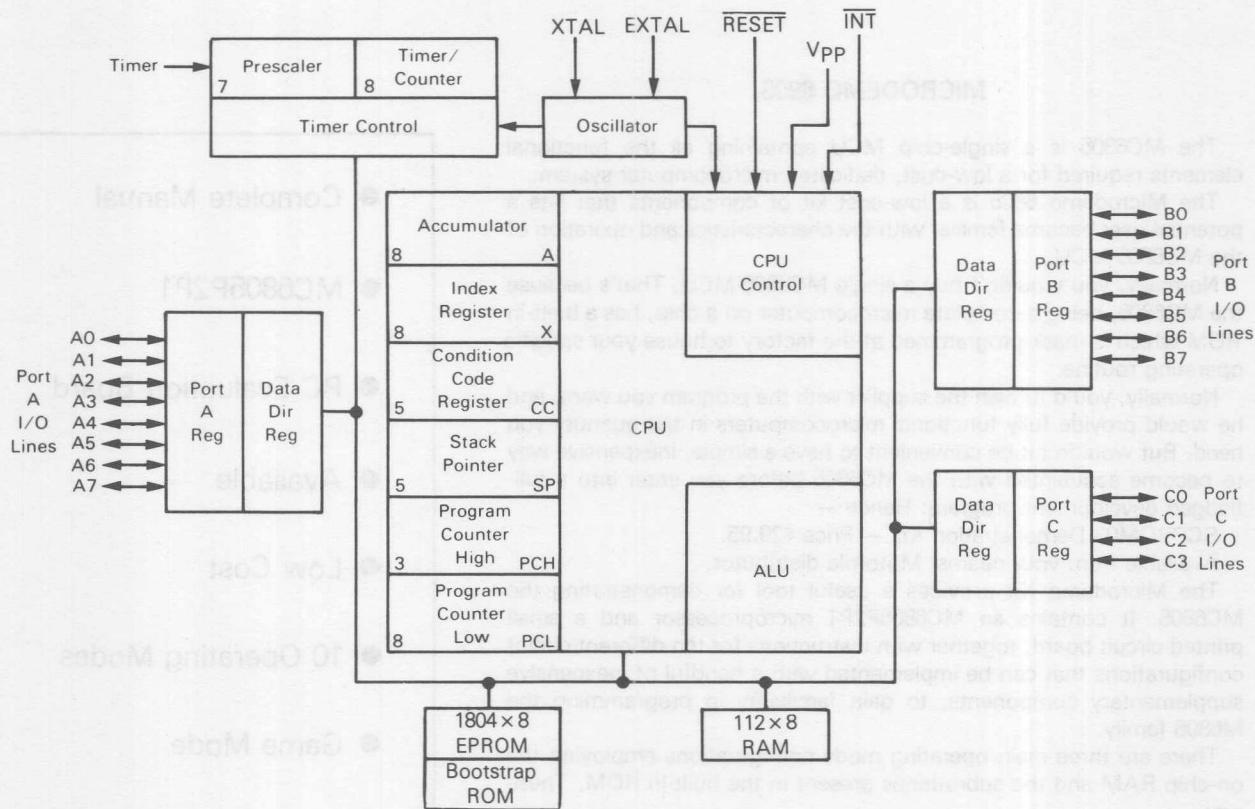


PIN ASSIGNMENTS

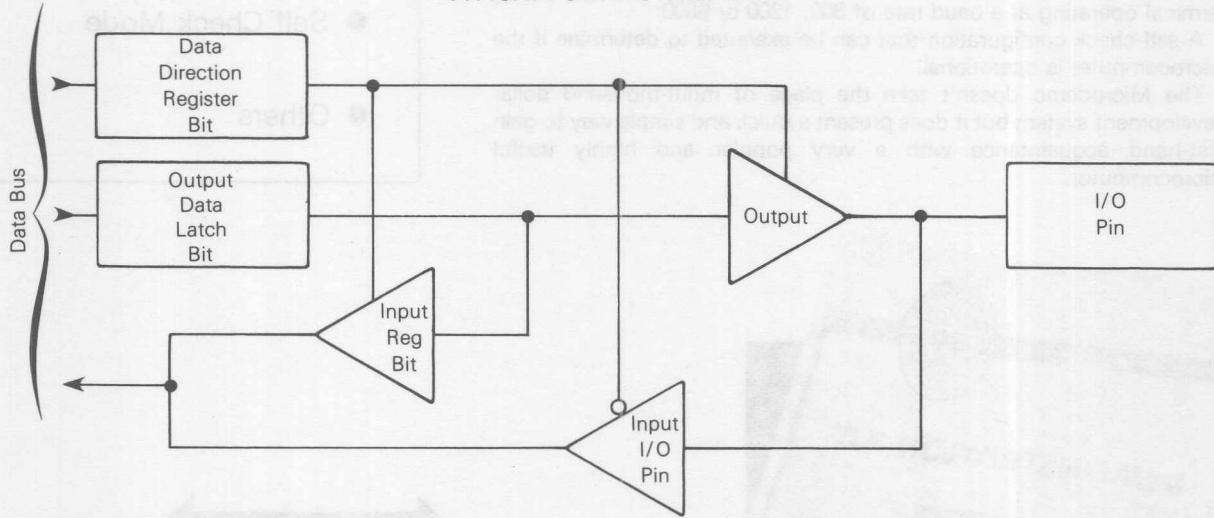
V _{SS}	1	RESET
INT	2	A7
V _{CC}	3	A6
XTAL	4	A5
EXTAL	5	A4
V _{PP}	6	A3
TIMER	7	A2
C0	8	A1
C1	9	A0
C2	10	B7
C3	11	B6
B0	12	B5
B1	13	B4
B2	14	B3

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MC68705P3 HMOS MICROCOMPUTER BLOCK DIAGRAM



TYPICAL PORT I/O CIRCUITRY



INPUT/OUTPUT

There are 20 input/output pins. All pins are programmable as either inputs or outputs under software control of the data direction registers. When programmed as outputs, all I/O pins read latched output data regardless of the logic level at the output pin due to output loading. When Port B is pro-

grammed for outputs, it is capable of sinking 10 milliamperes on each pin. All input/output lines are TTL compatible as both inputs and outputs. Port A lines are CMOS compatible as outputs while port B and C lines are CMOS compatible as inputs.



MOTOROLA Semiconductor Products Inc.

MICRODEMO 6805

The MC6805 is a single-chip MCU containing all the functional elements required for a low-cost, dedicated microcomputer system.

The Microdemo 6805 is a low-cost kit of components that lets a potential user become familiar with the characteristics and operation of the MC6805 MCU.

Normally, you wouldn't buy a single MC6805 MCU. That's because the MC6805, being a complete microcomputer on a chip, has a built-in ROM which is mask-programmed at the factory to house your specific operating routine.

Normally, you'd furnish the supplier with the program you want, and he would provide fully functional microcomputers in the quantity you need. But wouldn't it be convenient to have a simple, inexpensive way to become acquainted with the MC6805 before you enter into a full-fledged development program? Hence —

SCPROM03 Demonstration Kit — Price \$29.95.

Available from your nearest Motorola distributor.

The Microdemo Kit provides a useful tool for demonstrating the MC6805. It contains an MC6805P2P1 microprocessor and a small printed circuit board, together with instructions for ten different circuit configurations that can be implemented with a handful of inexpensive supplementary components, to gain familiarity in programming the M6805 family.

There are three main operating mode configurations employing the on-chip RAM and the subroutines present in the built-in ROM. These are:

A Games Mode, used to test the user's skill in following tone sequence routines.

A Monitor Mode configuration which allows connection directly to a terminal operating at a baud rate of 300, 1200 or 9600;

A self-check configuration that can be executed to determine if the microcomputer is operational.

The Microdemo doesn't take the place of multi-thousand dollar development system but it does present a quick and simple way to gain first-hand acquaintance with a very popular and highly useful microcomputer.

- Complete Manual
- MC6805P2P1
- PC Evaluation Board
- Available
- Low Cost
- 10 Operating Modes
- Game Mode
- Monitor Mode
- Self Check Mode
- Others



AVAILABLE NOW



M6805 SUPPORT SYSTEM

The development of a microcomputer application is a significant investment which requires an in-depth analysis. One essential part of its cost is represented by the engineering time spent for the design and optimization of the application. Both hardware and software aspects are to be considered. The engineering time requirement can be considerably reduced by using high performance development and debugging tools.

The M6805 family is well supported with system development aids. The MEX6805 support module is fully compatible with any EXORciser®/EXORterm™ development systems. This permits the use of existing hardware and software for development of M6805-based systems.

The MEX6805 support module provides: a User System Evaluation (USE) capability, multiprocessor support, extensive debug commands, real time emulation, and stand-alone operation. The M6805 Support System is designed to provide the most practical and true emulation of the MC6805 processor while, simultaneously, providing the user with a debugging repertoire.

The architecture of the M6805 Support System permits the user to run multiple processors in the user target system while the debug function is limited to one processor at a time.

A wirewrap area, located at the top of the circuit board, allows the user to expand memory, simulate custom I/O or simulate other functions.

The M6805 Support System allows the use of on-board ROM, EPROM and external memory. It also allows the user to check the M6805 on-chip ROM.

A Macro assembler is provided which allows use of Macro produced relocateable object code and provides for conditional assembly.

Ordering and availability information is as follows:

Device	Motorola Part No.	Availability
MC6805P2	MEX6805	Now
MC6805R2	MEX6805R2	3Q80
MC6805U2	MEX6805R2	3Q80

M6805 SUPPORT SYSTEM

A GROWING FAMILY

The four HMOS microcomputers described in this brochure are just the beginning of the M6805 Family. The versatility of the processor architecture will be used for many different combinations of memory and interface features.

HMOS Microcomputers — The processor architecture and the die layout permit different memory array sizes in the future versions of the M6805 Family. Up to 64K of address space may be accommodated in the future. I/O features could include more analog channels, analog output, higher analog resolution, frequency synthesis, display drivers, etc. Watch for future HMOS additions to the M6805 Family.

CMOS Microcomputers — Low power single-chip MCUs will be introduced using a high-speed CMOS process. CMOS members of the M6805 Family share the instruction set, interrupt and application flexibility of the HMOS parts. Low operating current, very low standby current, wide operating voltage range, and higher noise immunity are added by the CMOS process.

CMOS Microprocessor — One member of the M6805 Family will be a ROM-less version. It includes RAM, I/O lines, timer, on-chip oscillator, and an expansion bus to access off-chip ROM. The CMOS microprocessor is used in multi-chip systems and as a prototype for single-chip applications.

CMOS Peripherals — To support the CMOS microprocessor, a series of peripheral ICs is in preparation. The first to appear is a low power time of day, calendar, and RAM circuit. Peripherals such as ROM, RAM, parallel I/O, etc., are planned. CMOS is adding a unique new dimension to the total Motorola microprocessor spectrum.

Motorola Part No.	Motorola Part No.	Supplier
MC6805	MEX6805	SGS
MC6805A	MEX6805A	SGS
MC6805B	MEX6805B	SGS

OTHER MOTOROLA MICROCOMPUTER FAMILIES

High Performance M6801 Family

- Single-Chip and Expandable
- 2 k Bytes of ROM
- 128 Bytes of RAM
- 31 I/O Lines
- 3 Function 16-Bit Timer
- Serial Communications Interface
- TTL Compatible I/O

- MC6800 Instruction Set Plus:
 - Multiply, 8×8
 - 16-Bit Instructions
- External and Timer Interrupts
- Object Code Compatible with MC6800
- MC68701 EPROM Version



CMOS M141000 Family

- 4-Bit MCU
- 1 k Bytes of ROM
- 64 4-Bit Words of RAM
- 4 Input Pins
- 19 Output Lines on MC141000
- 24 Output Lines on MC141200

- Output Display Drive PLA
- 20 mA Output Drivers
- On-Chip Oscillator
- 3 to 6 Volt Operation
- Low Power: 0.4 to 12 mW
- MC141099 ROM-Less Version for Prototyping



3870 Microcomputer

- Single Chip 8-Bit MCU
- 2 k Bytes of ROM
- 64 Bytes of RAM
- 32 I/O Lines

- Programmable Timer
- Crystal, LC, RC and External Oscillator Modes
- Second Source of MK3870

